Amimopina, An Australian Enid Land Snail

BY

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(Supported in part by National Science Foundation Grant G-16419)

(4 Text figures)

In an earlier publication (Solem, 1959) I suggested that *Bulimus macleayi* Brazier, 1876, variously referred to the Partulidae, Bulimulidae, and Camaenidae, probably was an enid. Through the courtesy of Dr. D. F. McMichael of the Australian Museum, Sydney, it was possible to study the anatomy of specimens of "*Bulimus*" *macleayi* from the bank of the Little Stewart River, Silver Plains, Cape York Peninsula, Queensland, Australia. They were collected from the leaves of trees by J. L. Wassell on March 15, 1959. The specimens and dissections are preserved in the Australian Museum, Sydney. Drawings of the pallial region and genitalia are by Harry Cleaver, a student at Antioch College, those of the radula and jaw by Miss Marcia Oddi, Temporary Summer Assistant, Chicago Natural History Museum.

Examination of the pallial region, genitalia, jaw and radula confirmed my earlier suggestion that *Bulimus macleayi* is an enid, belonging to the subfamily Cerastuinae (= Pachnodinae), but it is obviously distinct from the other genera that have been dissected. In having the very long atrium and vagina possessing heavy internal padding and being bound to the body wall, a very short spermatheca and the renal fold forming a closed ureter, it is immediately differentiated.

A brief discussion of the systematically important features follows:

Pallial region (Figure 1): Lung with strong venation, weaker between hindgut and rectal fold. Kidney (K) very long, tapering, only slightly broadened at base. Renal orifice (KO) near anterior tip, opening into a closed tube formed by appression of the upper edge of the renal fold to the surface of the kidney. Just before the lateral basal extension of the kidney the closed tube ends and the renal ridge (KR) rapidly decreases in size, ending just before the posterior margin of the pallial cavity. There is a small gap between the end of the renal fold and start of the rectal fold (HGR). The latter seems to vary in position, lying near the hindgut (as in the figured specimen) or midway between the hindgut (HG) and kidney. Low at first, the rectal ridge becomes a quite high, thin plate paralleling the hindgut and ending just beside the rectum near the pneumostome, forming a ureteric sulcus (KS).

The presence of at least a short renal fold is characteristic of many orthurethrans (for examples, see Steenberg, 1925), while in the enids many species have developed pallial folds. Seshaiya (1932: 4, fig.3) shows well developed, free rectal and renal folds in *Rachis punctata* (Anton) and Wiegmann (1901: 223) mentions an apparently long renal fold in several West China species. I am not, however, aware that any orthurethran with a pseudosigmurethrous urinary system has been reported. The formation of a tube by attachment of the renal fold duplicates the normal sigmurethrous condition. Almost certainly the rectal fold then serves as a channel through which the excretory products pass before leaving the mantle cavity. Many sigmurethrans have the portion of the ureter lying along the hind gut partly or almost completely an open groove. Available material was limited in numbers and not preserved in a suitable condition for determination of the microscopic anatomy of the pallial region. A comparison between the tissue structures in typical sigmurethrans and the pseudo-sigmurethrous *Bulimus macleayi* might yield quite interesting information on the origin of the sigmurethrous condition.

Genitalia (Figure 2): Ovotestis poorly preserved, apparently a linear series of clumped clavate alveoli. Hermaphroditic duct (GD) highly convoluted, slender. Talon reduced to a very short lobe deeply imbedded in albumen gland (GG). The latter is relatively large, thick at the base, tapering to a flat sheet posteriorly. Carrefour region not clearly differentiated. Prostate (DG) and uterus (UT) normal, short, approximately equal in length to the vagina (V). Free oviduct (UV), a short, coiled, moderately thick tube sculptured inside with weak pilasters. Spermatheca (S) a short, unstalked sac, very thin walled, lateral to the free oviduct and vagina, separated from them by a small muscular collar. Weak connective tissue binds it to the side of the free oviduct and it is too short to reach even the lower end of the uterus. Upper third of vagina weakly pilastered, lower portion

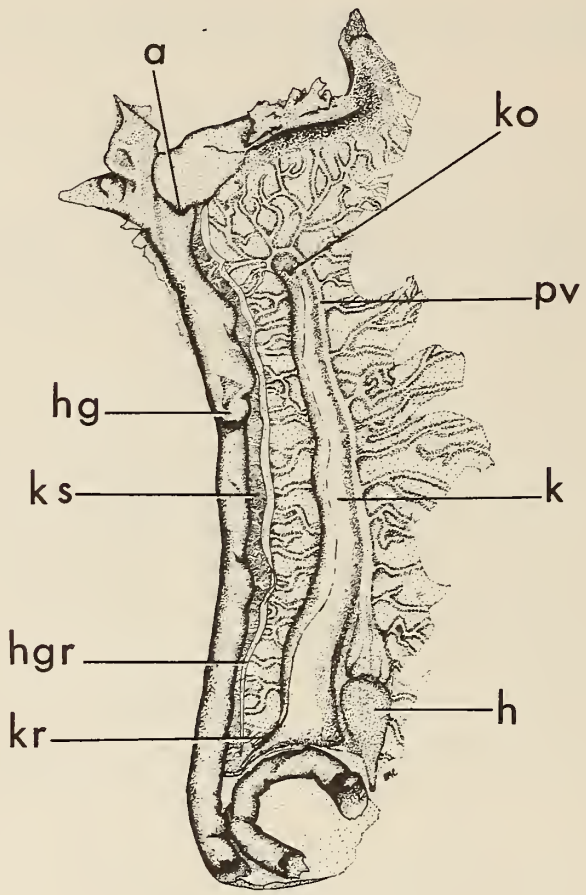

Figure 1: *Amimopina macleayi.* Pallial region, showing kidney (K), renal orifice (KO), pulmonary vein (HV), pericardium and heart (H), renal ridge (KR), hindgut (HG), rectal fold (HGR), anus (A) and ureteric sulcus (KS)

with a ring of thick, brown spongy tissue terminating above in a blunt arm. Below the insertion of the male system, the spongy mass is restricted to the outer wall and upper portion of the atrium (Y), leaving the inner wall free of glandularized tissue and consisting of a thin, muscular sheath. Atrium and vagina closely bound to body wall by muscular tissue. Atrium very long, wide.

Vas deferens (D), a thin white tube, loosely bound to free oviduct and vagina by connective tissue, tightly tied in to penioviducal angle. Shortly after starting up the penis, it passes into the thicker walled, larger epiphallus (E). The latter is largest in its midsection (incorrectly shown in drawing), tapering slightly before reflexing and lying bound to the penis (P), for slightly more than one-third length of the latter. Epiphallus longitudinally ribbed internally, entering penis laterally and subapically through a large, soft, very pliable pilaster occupying nearly all of the upper penial bulb. A thin penial flagellum (PF) with alveolar cells inserts just above entrance of epiphallus. Upper portion of thin walled penis with weak corrugations inside, gradually coalescing into small longitudinal pilasters in lower two-thirds. Penial retractor muscle (PR) inserts laterally just below entrance of epiphallus, arising on diaphragm, split near apex with other arm attaching to penial appendix (PL). Base of penis uniting with the larger duct of the appendix and opening into atrium at point where the ring of brown tissue forms only two-thirds of a circle. Lower portion of penial appendix thinwalled, with weak internal pilasters. Branch of penial retractor muscle (PRA) inserts transversely at lower edge of a

heavy muscular collar that separates the upper and lower portions of the appendix. Upper portion of penial appendix with very thick, muscular walls. From tip of the penial appendage, a very long, tubular flagellum (PLF) arises, becoming broader and flatter above. Upper end of flagellum lying next to diaphragm along base of pericardium and kidney, tip reaching hindgut.

Gonopore below and in front of right ommatophore, the same distance above the foot as the lower tentacle and equidistant from tentacle and ommatophore. Opening a vertical slit. Mass of atrial and vaginal brown tissue clearly visible through body wall, lying parallel to plane of foot.

The penial appendage with its long flagellum, the split penial retractor muscle, lateral entrance of the epiphallus and form of these organs is typically enid. In having a long, slender, penial flagellum and lacking an epiphallic caecum, plus the extremely short, unstalked spermatheca without a diverticulum, *Bulimus macleayi* immediately differs from the European-Asian genera (see Hesse, 1933 and Forcart, 1940). The few African and Asian genera that have been dissected show slightly longer, but similar, spermathecae and have a penial or epiphallic flagellum. For this reason, plus the similarities in radula and pallial folds, I have placed *B. macleayi* in the Cerastuinae.

Most land snails have a relatively short atrium which usually has some muscular or connective tissue extending from it to the body whorl. *Bulimus macleayi* seems unique, however, in having such a great extent of the atrium and

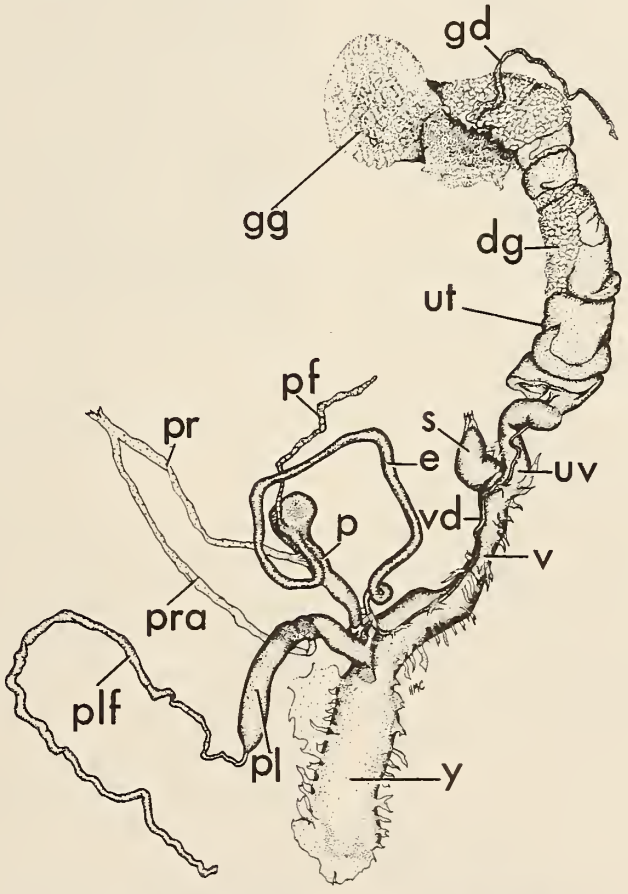

Figure 2: *Amimopina macleayi*. Genitalia, showing hermaphroditic duct (GD), albumen gland (GG), prostate (DG), uterus (UT), free oviduct (UV), vagina (V), spermatheca (S), atrium (Y), vas deferens (D), epiphallus (E), penis (P), penial retractor (PR), penial flagellum (PF), penial appendix (PL), penial appendix retractor (PRA), and flagellum of penial appendix (PLF).

vagina solidly bound to the body wall, and also in possessing such peculiar brown spongy padding inside the atrium and vagina. Normally the interior of these organs will

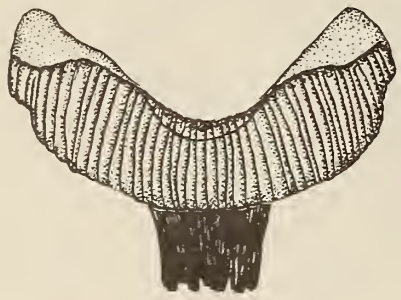

Figure 3: *Amimopina macleayi.* Jaw.

have weak pilasters, as are found in the penis and free oviduct of *B. macleayi,* but I know of no similar development in other land snails. Its function could conceivably involve dissolving of spermatophores, or it could be only a stimulatory pad.

Amimopina SOLEM, gen. nov.

Amimopina IREDALE, 1933, Rec. Austral. Mus., **19**, p. 42 (*nomen nudum*).

Pseudosigmurethrous orthurethra, the ureter formed by appression of the renal fold, pallial region with heavy venation. Spermatheca very short, free oviduct long with internal spongy tissue. Penis with flagellum and lateral entrance of the epiphallus. Penial retractor muscle arising on diaphragm, split with part inserting just above middle of penis and other part attaching below middle of penial appendix. Penial appendix with long flagellum, retractor muscle attaching to muscular collar. Atrium long, broad, tightly bound to body wall, internally with brown spongy tissue. Jaw of narrow, partially fused plates. Radula with central tooth unicuspid, six laterals and 43 marginals. Marginal teeth with progressive splitting of cusps. Basal plates moderately elongated. Shell conic, brownish-yellow, with faint radial striations. Lip simple, not expanded or reflexed.

Type species: *Bulimus macleayi* BRAZIER, 1876.

Serious doubts exist concerning the availability for nomenclatural use of many generic names proposed by Tom Iredale. A strong case can be made that many of his names were never published in the technical sense of the word. Following Article 13 of the International Code of Zoological Nomenclature (p. 42 of the 1961 edition), in order for a name published after 1930 to be available, it ". . . must be either (i) accompanied by a statement that purports to give characters differentiating the taxon; or (ii) accompanied by a definite bibliographic reference to such a statement; or (iii) proposed expressly as a replacement for a pre-existing available name." Iredale's casualness in introducing new names is legendary among zoologists. His descriptions, when present, are apt to be sketchy, at best. It is impossible to evaluate the systematic position of his names from the publications, since he seldom gave comparisons or adequate diagnoses of new taxa. ZILCH (1960, pp. 725 - 730) listed 265 generic and subgeneric names proposed by Iredale that he could not evaluate and place in his supraspecific monograph of the Euthyneura. Many Iredalean names *are* validly proposed from a nomenclatural viewpoint, however *scientifically inadequate* their descriptions. Other names "diagnosed", for example, as "It, however, seems more like the former (*Georissa*) than the latter (*Omphalotropis*), and as it is conchologically neither, the new name *Omphalorissa* is introduced for it" could hardly be considered as adequately differentiated. Such names I consider to be *nomina nuda.* Subsequent studies may show that generic names are needed for many species groups covered now only by Iredalian *nomina nuda.* When this happens, formal descriptions, preferably utilizing the same names can be published, with the names being validated from the later study. Each one of Iredale's names will have to be judged separately, and it will be many years before their status can be settled. In previous studies I have been guilty of

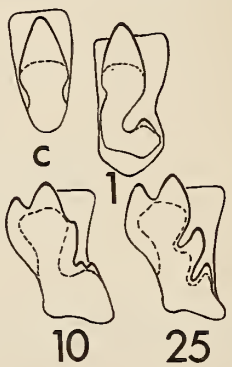

Figure 4: *Amimopina macleayi.* Radular teeth, showing central tooth, first lateral, fourth marginal (tenth tooth) and 19th lateral (25th tooth).

accepting his names as being validly proposed, although reducing them to synonymy, without testing whether they meet the requirements for publication.

Amimopina is a case in point. After mentioning a referral of *Bulimus macleayi* to *Papuina* (Camaenidae) that he considered incorrect, IREDALE (1933, p. 42) states "It may be noted that KOBELT (Conch. Cab., ed. KUSTER [*sic*], Bd. i, Abth.13, *ante* Sept., 1901) referred the species *macleayi* to *Bothriembryon* (Bulimulidae), a worse selec-

tion than *Papuina,* so the new generic name *Amimopina* is proposed, the Australian *B.(ulimus) beddomei* BRAZIER being the type." IREDALE did not (i) have "a statement that purports to give characters differentiating the taxon", (ii) give "a definite bibliographic reference to such a statement", and (iii) no generic name had ever been proposed for *Bulimus beddomei,* so he was not proposing a substitute name. Therefore, *Amimopina* does not meet the criteria of availability of the International Code of Zoological Nomenclature. Subsequent mention of the name in the literature is restricted to listing in check lists (IREDALE, 1938, 1941) or in publications without any diagnostic characters (SOLEM, 1959 a, p. 59 and SOLEM, 1959 b, pp. 154, 157). Since the animal does possess quite distinctive characteristics, the shell differs from most enids, and it obviously can not be placed in a previously described genus, I have formally described *Amimopina* at this time. I consider previous references to be *nomina nuda* and the genus *Amimopina* will have to date from publication of this article.

No genus seems to be closely related. The Indian-African *Rachis* (see SESHAIYA, 1932) has a similar pallial structure, except for the appression of the renal ridge to the kidney, but the much larger spermatheca, presence of an epiphallic caecum, quite different radular teeth and colorful, much thicker shell immediately separates them generically. The conic, brown, rather featureless shell is reminiscent of the South African *Pachnodus,* but the latter have not been dissected and most species are more broadly conic with a peripheral keel which is lacking in *Amimopina macleayi.*

A synonymy of the single species follows.

Amimopina macleayi (BRAZIER, 1876)

Bulimus macleayi BRAZIER, 1876, Proc. Linn. Soc. New South Wales, **1**: 108 - Yule Island, Papua; BRAZIER, 1880, *op. cit.,* **4**: 395 - east side of Yule Island, Papua; TAPPARONE-CANEFRI, 1883, Ann. Mus. Civ. Storia Nat., Genova, **19**: 104, plt. 2, figs. 16, 17; HEDLEY, 1891, Proc. Linn. Soc. New South Wales, **16**: 97; PILSBRY, 1909, Man. Conch., (2) **20**: 319; IREDALE, 1933, Rec. Austral. Mus., **19** (1): 42; SOLEM, 1959, Arch. f. Mollusk. **88**(4 - 6): 154, plt. 12, fig. 6.

Bulimus beddomei BRAZIER, 1876, Proc. Linn. Soc. New South Wales, **1**: 127 - Mt. Ernest Island, Torres Strait, Australia (*nomen nudum*); BRAZIER, 1880, *op. cit.,* **4**: 395 - Mt. Ernest Island, Torres Strait; Thursday Island, Torres Strait; Fanny Bay, Port Darwin; Andromache River, between Bowen and Cape Palmerston; TATE, 1882, Trans. Proc. Rep. Roy. Soc. S. Australia, **5**: 50; HEDLEY, 1888, Proc. Roy. Soc. Queensland, **5**: 64; IREDALE, 1933, Rec. Austral. Mus., **19** (1): 42.

Partula macleayi (BRAZIER), HEDLEY, 1894, Proc. Linn. Soc. New South Wales, (2) **19**: 387, plt. 26, figs. 22, 23 - Rigo, Papua (radula and jaw figured).

Papuina macleayi (BRAZIER), PILSBRY, 1900, Manual Conch., (2) **13**: 121, 122, plt. 4, figs. 66 - 68.

Bothriembryon macleayi (BRAZIER), KOBELT, 1901, Syst. Conch. Cab., I (13) **2**: 767, 768, plt. 112, figs. 10, 11.

Amimopina beddomei (BRAZIER), IREDALE, 1938, Austral. Zool., **9** (2): 93.

Amimopina macleayi (BRAZIER), IREDALE, 1941, *op. cit.,* **10** (1): 64.

Aminopina (sic) macleayi (BRAZIER), SOLEM, 1959, Arch. f. Mollusk., **88** (4 - 6): 154, 157.

Range: South coast of New Guinea in the vicinity of Port Moresby (Rigo and Yule Island), islands in Torres Strait and coastal Queensland as far south as Cape Palmerston (22° 20′ S), and Northern Territories near Port Darwin.

Remarks: Although IREDALE (1933: 42) states that "there are differences" between Brazier's two forms and that another form lives near Port Essington, material I have examined belongs to one species. No large series of specimens exist in collections, but available specimens show such minor differences that specific separation is very unlikely.

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Foxidonta, A Solomon Island Trochomorphid Land Snail

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(Supported in part by National Science Foundation Grant G-16419)

(5 Text figures)

CLENCH (1950) described *Foxidonta stevensoni* as an endodontid land snail. Examination of paratypes had convinced me that it was not an endodontid, since the characteristic endodontid reticulated microsculpture was absent. I had surmised that it might be a camaenid near *Coliolus*, but this was only on the basis of shell features.

Through the kindness of Rev. H. E. J. Biggs, I obtained several preserved specimens and was able to study the gross anatomy. Rather to my surprise, *Foxidonta* is a trochomorphid land snail very near to *Videna* and *Brazieria* in anatomical structures, although obviously differing in shell form and sculpture.

For providing the material to be dissected, I am deeply indebted to Rev. Biggs. The drawings of the foot, pallial region and genitalia are by Harry Cleaver, a student at Antioch College. The other drawings are by Miss Marcia Oddi, Temporary Summer Assistant, Chicago Natural History Museum.

A redescription of the genus follows:

Genus *Foxidonta* CLENCH, 1950

Aulacopod sigmurethra, radular teeth with elongated basal plates, marginals bicuspid. Spermatheca inserting on base of penis. Epiphallus entering penis apically, penial retractor muscle inserting at junction of epiphallus and penis. Penis with a simple pilaster apically, lower portion with several small pilasters radiating in a fan shape from base of a groove. Pallial region without distinct venation, some scattered black and white color patches. Shell very elevated, conical, strongly carinated. Apex with weak spiral lines above, developing radial growth striae near its end. Lower whorls with irregular, prominent, low, triangular ribs, usually with very long periostracal extensions. Umbilicus narrowly open, columellar lip moderately reflected.

The lack of distinct pallial venation, sausage-shaped kidney, bicuspid lateral radular teeth with elongated basal plates, presence of pedal grooves, and insertion of the spermatheca on the penial side of the penioviducal angle at once relate *Foxidonta* to the *Videna, Brazieria, Hogolua, Kondoa* complex of Indonesia and the Caroline and Palau Islands. *Foxidonta* differs primarily in the simple internal structures of the penis. The other genera have much more complicated penial structures. Conchologically, *Foxidonta* differs by its larger size, conical shape, lack of parietal dentition, the presence of heavy radial growth ribs and the very elevated spire. The most similar shell is the much smaller *Videna (Peleliua) pagodula* (SEMPER, 1870).

A brief description of the systematically important anatomical features follows.

Foot with undivided sole, pedal grooves (Figure 1) moderately prominent, uniting across the tail. No caudal foss or horn. Pallial region (Figure 2) with sausage-shaped kidney (K) about twice as long as the pericardium (H) and one third the length of the pallial cavity. Hindgut (HG) and secondary ureter (KD) opening at base of pneumostome. Principal pulmonary vein (HV) without branches, surface of pallial wall with weak